ON TWO SPECIES OF ATHECATE HYDROIDS ASSOCIATED WITH SCORPÆNOID FISHES

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TWO FIGURES AND THREE PLATES

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INTRODUCTION

In 1892 Alcock described a kind of athecate hydroid which was found growing on the body of a scorpænoid fish, *Minous inermis* Alcock[1], taken at a depth of from 45 to 70 fathoms in the Bay of Bengal and the seas off the Coromandel and Malabar Coasts of India. He referred the hydroid to the genus *Stylactis*, because he thought he noticed some sporosacs attached to the colony, although in other respects it showed affinity with *Podocoryne*. Some years later (1899), he obtained more material of the same hydroid which was found coating all the specimens of the same fish dredged off the Malabar Coast.

Doflein, during his collecting trip in Japan in 1904-1905, obtained a similar kind of hydroid attached to the same *Minous inermis* in the Sagami Bay, at a depth of 150 m. This hydroid was examined by Stechow (1908, 1909, 1913), who identified it with Alcock's *minoi*; but, since he found well-developed medusæ with four radial canals and four long tentacles, instead of sporosacs, growing on the colony, he assigned the hydriod to the genus *Podocoryne*. Later, however, in 1921, he proposed a new generic name *Podocorella* for this species, because the medusa has no oral tentacles characteristic of *Podocoryne*, and most of the blastostyles are devoid of any tentacle.

These are apparently all of the existing records of this interesting hydroid. As to other instances of the symbiosis, as well as the parasi-

[1] More correctly, *Minous monodactylus* (Bloch & Schneider) (Heath, 1910).

tism, between hydroids and fishes, the reader is referred to Gudger's comprehensive work (1928) dealing with this subject.

Last spring, an individual of another kind of scorpænoid fish *Erosa erosa* (Langsdorf) was taken from the littoral near the Seto Marine Biological Laboratory. This fish was coated with a luxuriant growth of a similar kind of hydroid (Pl. 27). The study of this hydroid led me to feel the necessity for comparing it with the hydroid which grows on *Minous inermis*. Fortunately, through kindness of Mr. M. Yeri of the Misaki Marine Biological Station, I obtained the desired material, which was found on a young individual of that fish dredged from about 20 fathoms off Misaki (Pl. 26 A). Comparative study of these two examples of hydroids associated with the different species of the scorpænoid fishes, has revealed that they are undoubtedly different kinds of athecate hydroids, and that the one from Seto is a form which has never been reported previously. The example from Misaki is to be identified as *Podocorella minoi*; however, our knowledge on this species is rather limited, so that a brief statement on it here may not be amiss.

Podocorella minoi (Alcock)

(Plate 26)

There is no room for doubting that the hydroid which is associated with *Minous* taken at Misaki belongs to the same species as Stechow's examples. In the material before me, the hydroid covers the greater part of the body of the fish, even the cornea of the eyes bearing some polyps. The polyps are especially abundant on the dorsal fin and the belly; only the caudal and anal fins, as well as the throat, are regions nearly free of the polyps (fig. A).

The hydroid (fig. B) is like *Podocoryne* in its general appearance, as was noticed by the previous authors. The hydrorhiza (*hr*) is formed by delicate filamentous stolons, some 0.03 mm. in thickness, which is coated with a very thin and soft membrane. It branches out profusely, and makes anastomoses to some extent, but it does not form an extensive network such as is found in the other hydroid to be mentioned

later. At the base of each polyp, stretches a sheet of cœnosarc which forms a sort of pedestal for each polyp. No spinous growth occurs on the hydrorhiza.

There are two kinds of polyps: the gastrozooids (*ga*) and the blastostyles (*bl*). The gastrozooid is up to 3.5 mm. in height in the contracted state. The hypostome is cylindrical, and is encircled by numerous tentacles which number 30-40 in the fully-developed polyps. Young polyps may be only 1 mm. in height and the tentacles less than 10 in number.

The blastostyle is rather characteristic. It is much smaller than the gastrozoid, being about 0.5 mm. in height, and has no mouth opening. The column consists of two portions: a thicker basal portion which occupies 1/2-2/3 the entire height, and a thinner distal portion forming the rest. The tentacles are degenerated more or less. Some blastostyles may be entirely devoid of tentacle; but usually there are 1-4 tentacles of various length, of which the longer ones are often twisted in a spiral. The gonophores (*go*) are attached to the tip of the thicker portion of the column; they are up to 4 in number and of various size. Stechow has observed that the fully-developed gonophores are provided with 4 long thick tentacles. The present specimen is still young, and bears no gonophore which has developed the tentacles. Nevertheless, the structure of the gonophore foreshadows that it ultimately becomes a free medusa (textfig. 1).

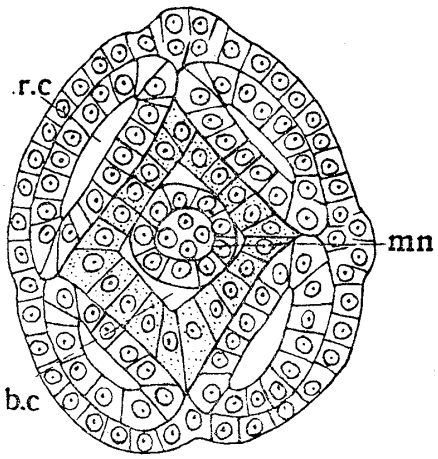

Fig. 1—*Podocorella minoi* (Alcock). Cross-section of the medusa-bud. × 600. *b.c.* bell-cavity; *mn.* manubrium; *r.c.* radial canal.

Besides the grastrozooids and blastostyles, there occur a few small filamentous bodies twisted slightly, growing direct from the stolon; these are probably the so-called nematozooids (*n*).

The hydroid grows on an individual of *Minous inermis* taken on July 20, 1931 at the depth of 20 fathoms off Misaki.

Stylactis piscicola n. sp.

(Plates 27 & 28)

As mentioned above, the hydroid grows on *Erosa erosa* (Langsdorf) a scorpænoid fish allied to *Minous*. It was observed in the living state, and also as preserved material. The polyps are especially numerous on the dorsal regions of the host, and some are found on the throat and belly, and also on the basal parts of the dorsal and pectoral fins, only the head and the pelvic and caudal fins being regions free of the hydroid (Plate 27).

The hydroid is an athecate of a rather primitive type (Plate 28). The hydrorhiza (*hr*) is made up of a stolon of some 0.1 mm. in thickness, rather regularly reticulate, and coated with a thin and soft membrane. As compared with that of the former species, however, the stolon is much thicker, and the membrane is tougher, and the whole hydrorhiza forms a more distinct network. The gastrozooid (*ga*) is very slender, and the large ones attain 10 mm. when fully stretched; in the preserved material they are about 5 mm. long. The hypostome is cylindrical, and encircled by 15-25 very slender tentacles. The younger polyps may be much smaller and the tentacles fewer. There are also a few polyps, which have an exceptionally stout body and more than 30 tentacles. On the whole, the gastrozooid is distinctly more slender than that of the former species and the tentacles are fewer.

The blastostyle (*bl*) is not much different from the gastrozooid; only it is smaller than the latter, and is provided with less than 12, usually 5-8, short, but well-developed, tentacles and a mouth opening. The gonophores (*go*) are attached to the basal half of the column, there being 1-3 gonophores on the same polyp. These are spherical or slightly oblong, and the larger ones are about 0.4 mm. in diameter.

Contrary to that of the former species, the gonophore is apparently a sporosac of the eumedusoid type, provided with four distinct radial canals and an entodermal lamella in the bell (textfig. 2). Neither the bell nor the manubrium, however, has any opening, and the bell cavity is filled with large eggs for the greater part, leaving only a small space inside the bell wall. No nematozooid could be found in spite of

a careful search for it. Acute spinous growths, though scant, do occur; these are covered with a comparatively thick periderm layer colored brownish.

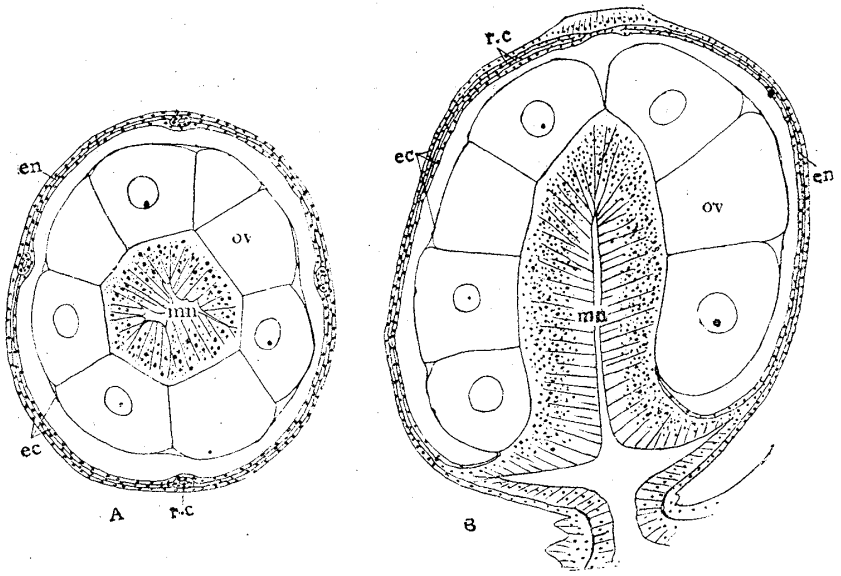

Fig. 2—*Stylactis piscicola* n. sp.
A. Cross- and B. longitudinal sections of the sporosac. × 120. *ec.* ectoderm; *en.* entoderm; *mn.* manubrium; *ov.* ova; *r.c.* radial canal.

When fresh, the general color of the hydroid is light pink; the hypostome appears whitish by the presence of numerous nematocysts, while the part below the tentacle ring appears brownish through the occurrence of brownish pigment on the upper part of the gastric wall. The gonophore is purplish.

The hydroid is attached to *Erosa erosa*, taken early in April, 1932, in the littoral of Seto.

REMARKS

As is stated above, there is no doubt that the hydroid which is attached to *Minous* taken at Misaki, is identical with Stechow's examples. Besides the almost complete agreement of the states of

both the gastrozooid and the blastostyle with his descriptions and figures, the host belongs to the same species and was collected from the same locality. It is less easy to decide, however, whether the type specimen of '*Stylactis*' *minoi* which Alcock obtained in the Indian sea was identical with the specimens from Japan, the original description being much too brief and the figure too imperfect. Nevertheless, Alcock's statement on the blastostyle that, "The proliferous polyps are very much smaller than the others, being on an average hardly one-third of their length; they further differ in possessing but few—at most six—tentacles, and those short, slender and fragile. Near the middle of their body they are much constricted, and here either two or three closed grapestone-shaped sporosacs arise on very short peduncles" conforms well with the characteristics of the blastostyle borne by the Japanese specimens. Thus Stechow's identification of his specimens with Alcock's *minoi* seems adequate. Also his opinion that this species has to be assigned not to *Stylactis*, but to a genus akin to *Podocoryne*, seems likewise to be justified, since the hydroid develops gonophores which are probably liberated as medusæ, instead of sporosacs as formerly supposed. The blastostyle, however, is rather pronouncedly different from that of *Podocoryne*, so that this species probably deserves a special genus of its own, as Stechow maintains.

As for the latter species which coats *Erosa erosa* obtained at Seto, there is no question but that it is different from the former species. The characteristics belonging to the hydrorhiza, the gastrozooid, and especially to the blastostyle and gonophore, all warrant this view. Question remains, however, as to which of the three allied genera, *Hydractinia*, *Podocoryne* and *Stylactis*, this species is to be referred to. The definition of these genera seems to be much disputed. But, according to Goette (1916), who made the most minute comparative study of those genera, they seem to be distinguished in the first place by the state of the hydrorhiza. In *Stylactis*, the hydrorhiza is a simple network of a soft stolon, while in the other genera it develops a more or less compact skeleton. Next, the state of the gonophore is variable within one and the same genus; but *Podocoryne* usually develops free medusæ, while *Hydractinia* always bears sporosacs. Of *Stylactis*, the European species *S. inermis* Allman is known to develop the sporosacs

of the eumedusoid type; one of the American species, *S. hoopei* Sigerfoos, on the other hand, liberates degenerate medusæ which live only a few hours (Sigerfoos, 1899), while in the other species, *S. argo* Clark, the gonophore may either remain sessile or become free (Mayer, 1910). The present specimen is apparently too young to enable us to decide whether the gonophore is liberated eventually, or remains attached. But the very large size of the eggs contained in the bell cavity, supports the view that the gonophore remains either sessile, or it is a degenerate medusa, if liberated at all.

Thus it seems clear that, both in respect to the characteristics of the hydrorhiza, and to those of the gonophore, the present specimen belongs to the genus *Stylactis*. Of this genus it probably represents a new species, which is characterized by its peculiar mode of occurrence, and also by the blastostyle being much smaller than the gastrozooid, and bearing gonophores on its basal half.

Both Alcock and Stechow are inclined to the belief that the association of the hydroid with the fish *Minous* is a case of symbiosis, since they found no individual of the fish without the hydroid, nor any colony of the latter growing elsewhere than on that particular kind of fish. Heath (1910), however, obtained several individuals of the fish without any hydroid attached to them, and he is sceptical about the validity of the above interpretation. In the case of association between *Erosa* and *Stylactis* recorded here also, the association seems to be only a facultative one, since the fish is commonly found without any hydroid associated with it.

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PLATES

ABBREVIATIONS

bl. blastostyle;
ga. gastrozoöid;
go. gonophore;
hr. hydrorhiza;
n. nematozoöid.
sp. spine.

PLATE 26

Podocorella minoi (Alcock).

Sketches of the preserved specimen.

A. The colony growing on *Minous inermis* Alcock. × 4.

B. A part of the colony. × 30.

ATHECATE HYDROIDS ASSOCIATED WITH SCORPÆNOID FISHES PLATE 26

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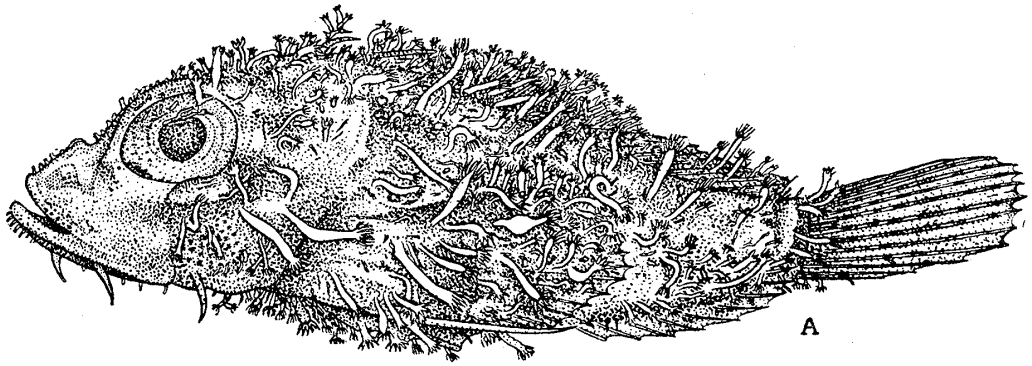

PLATE 27

Stylactis piscicola n. sp.

Sketch in the preserved state. The colony growing on *Erosa erosa* (Langsdorf). × 15.

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PLATE 27

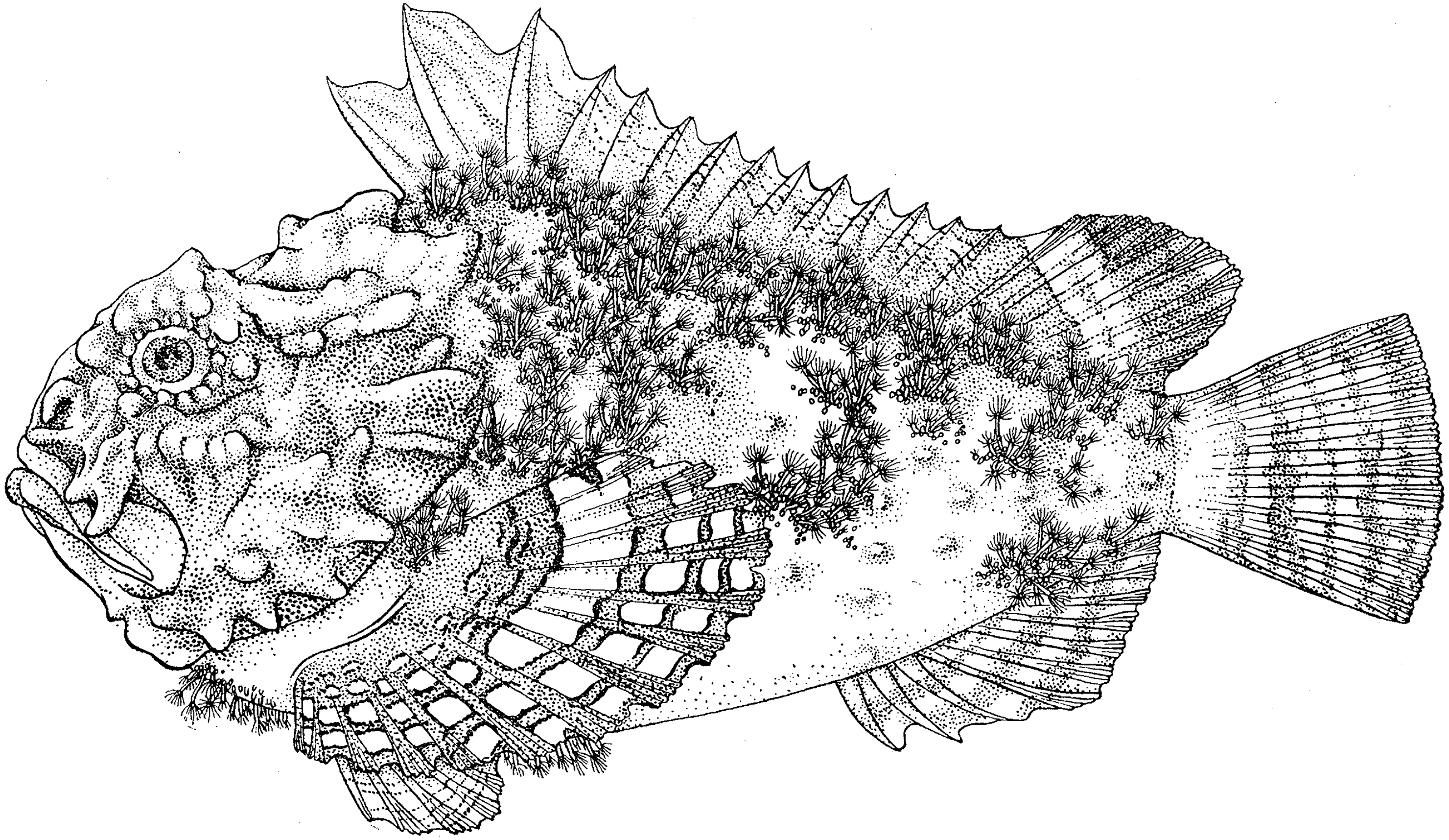

PLATE 28

Stylactis piscicola n. sp.
Sketch in the living state. × 12.

ATHECATE HYDROIDS ASSOCIATED WITH SCORPÆNOID FISHES PLATE 28

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